DOCUMENT RESUME

ED 455 098 SE 064 765

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TITLE The Role of Children When Mothers Return To Study Mathematics in the Further Education Sector: Benefits for Both.
PUB DATE 2000-12-00
NOTE 14p.; Paper presented at the Annual Meeting of the Australian Association for Research in Education (Sydney, Australia, December 4-7, 2000).
AVAILABLE FROM For full text: http://www.aare.edu.au/00pap/bre00239.htm.
PUB TYPE Reports - Evaluative (142) -- Speeches/Meeting Papers (150) -- Tests/Questionnaires (1[illegible])
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Elementary Secondary Education; *Family Environment; Foreign Countries; *Mathematics Achievement; Mathematics Instruction; *Parent Background; *Parent Influence; Socioeconomic Influences
IDENTIFIERS Australia

ABSTRACT

It is well documented that children of middle-class parents generally do better at school than their working-class peers and despite increases in school retention rates in Australia, this remains the case. Social reproduction theories are often used to describe this phenomenon. Social reproduction theory assumes that a family's class position is generally fixed by early adulthood, based on the occupation and education and associated values and attitudes acquired by the parents-to-be. But what happens when social class becomes more fluid, and parents markedly raise their educational status after their children are born? Do the children inherit their old level of cultural capital or the new? Empirical studies in mathematics education demonstrate a large indirect relationship between home environment and mathematical achievement. These studies conclude that ways are needed to improve the home environment in such a way as to enhance the learning of mathematics because the benefits for children's mathematical achievements are potentially quite large. In this paper case studies of women with children who have returned to study mathematics in the further education sector are presented. Interview data from both the adult students and their children provide evidence of a synergistic relationship in the intellectual and personal development of women and their children. (Contains 21 references.) (Author)

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ED 455 098 RE00239 AARE 2000

The role of children when mothers return to study mathematics in the further education sector: benefits for both

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Abstract

It is well documented that children of middle-class parents generally do better at school than their working-class peers and despite increases in school retention rates in Australia, this remains the case. Social reproduction theories are often used to describe this phenomenon. Social reproduction theory assumes that a family's class position is generally fixed by early adulthood, based on the occupation and education and associated values and attitudes acquired by the parents-to-be. But what happens when social class becomes more fluid, and parents markedly raise their educational status after their children are born? Do the children inherit their old level of cultural capital or the new?

Empirical studies in mathematics education demonstrate a large indirect relationship between home environment and mathematical achievement. These studies conclude that ways are needed to improve the home environment in such a way as to enhance the learning of mathematics because the benefits for children's mathematical achievements are potentially quite large. In this paper case studies of women with children who have returned to study mathematics in the further education sector are presented. Interview data from both the adult students and their children provide evidence of a synergistic relationship in the intellectual and personal development of women and their children.

Introduction

There are multiple reasons put forward to explain the lower school achievements of the children of parents from lower socio-economic backgrounds. The theoretical frameworks to describe this phenomenon come under 'social reproduction' theories (Burns & Scott 1997). One perspective describes a deficit model in which working-class parents are proposed to value education less highly and to have lower aspirations for their children. Another perspective put forward is that parents from lower socio-economic backgrounds lack knowledge and confidence to be involved in their children's education due to limited or poor school experiences (Coleman 1988, Marjoribanks 1995). Burns and Scott (1997) state that "social reproduction theory assumes that a family's class position is generally fixed by early adulthood based on occupation/education and the associated values acquired by the parents-to-be" (p.210). These authors suggest this assumption may be challenged if parents' markedly raise their own educational status while still raising a family. They ask, "do the children inherit their old level of cultural capital or the new level? And if it is the new level, what are the processes through which this is transmitted?" (p.210).

Women who are early school leavers and who have been able to take advantage of the opportunity to return to study in tertiary institutions commonly report gaining new confidence, greater understanding, wider interests and better conversation skills (Kelly, 1987; Burns, Scott & Cooney, 1993). With respect to the influence on their children, these authors present evidence to suggest that there is a substantive flow-on effect, particularly for older children. While specific tutoring skills were mentioned, respondents also commonly emphasised broader factors such as their influence as a role model, their increased ability to understand their children's thinking, and the more intellectual climate in the household. Both Kelly (1987) and Burns and Scott (1997) noted that a limitation of their studies was a reliance on the women's impressions concerning the impact of their return to study on their children. The current gap in the literature would appear to be the voices of the children, their perspectives and experiences, when their mother returns to study.

With respect to children's mathematical skills, the relationship with the home environment is not well documented according to Crane (1996). From the empirical literature available, for grade 8 students it had the largest indirect effect (Reynolds and Walberg, 1992). Crane (1996) also tested the impact of home environment, socio-economic status, ethnicity and maternal cognitive skills on students' mathematical achievement. The effect of the home environment was large, particularly when the children were younger, but for older children it had significant effects as well.

This paper is part of a larger study (Brew, in press), that is seeking to integrate two epistemological frameworks: Belenky,

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Clinchy, Goldberger and Tarule (1986); and Baxter Magolda (1992). The central aim of the study is to provide an epistemological lens through which to better understand the intellectual experiences of women returning to study in the further education sector, with a particular focus on the learning of mathematics. The study is also based on the direction of current writings in the research area of "Women and mathematics". These writings call for strategies to counter traditional mathematics pedagogy and epistemology which has alienated many girls and women by not appreciating or validating their ways of knowing (Burton, 1995, 1996; Becker, 1995, 1996). This direction is also consistent with current writings on mathematics education more generally that is focusing on investigating the socially-situated and cultural aspects of learning mathematics (Cobb & Bauersfeld, 1995; Mercer, 1995).

In this paper I describe a theme that has emerged in relation to the key role that children can play as an ongoing motivational factor for women returning to study. Through the changing dialogue in the home, the women's children assist them not only in their mathematical learning, but, it is proposed, more broadly in their intellectual growth. Central to Baxter Magolda's thesis is that as students shift away from an absolute orientation to knowledge this is associated with an increasing role for significant others (peers, teachers) in learning.

Baxter Magolda (1992) did not discuss the role of children and Belenky et al. (1986) only did so briefly. In a more recent study, Belenky (1996) found that programs set up by midwife teachers for women to provide self help networks were having an important positive impact on the relationship between the women and their children. This outcome could be traced to changes in the formers' ways of knowing.

> These women influenced their children's behaviour by engaging them in reflective dialogue, drawing out their problem solving abilities. By contrast, the women who did not see themselves as thinkers seemed much less aware of their children's thinking processes. They relied almost exclusively on authoritarian, power-oriented child rearing techniques. ... These programs might well lead to more democratic families and the ripple effect will be felt down through the generations (p.396-397).

In this paper the role of children is tentatively proposed as a further significant other extending Baxter Magolda's framework.

The further education sector

In Australia, the further education sector plays a vital role in the ongoing learning of adults, particularly for women. For those people for whom the schooling system has failed, it can often provide a safe, friendly, and non-coercive learning environment (Teese, Davies, Polesel & O'Brien, 1999). Despite the introduction of a competency based learning model in this sector during the 1990s (Beevers, 1993) the Adult Community and Further Education Board has produced a conceptual framework document, within the competency-based requirements, to reiterate the strengths of the sector (Bradshaw, 1999). This document has formalised into policy four key principles to enable the naming and evaluating of further education curriculum: multiplicity, connectedness, critical intelligence and transformation. These principles strongly resonate with the epistemological schemas proposed by Belenky et al. (1986) and Baxter Magolda (1992).

Research sites and adult participants

This paper draws on data collected from the case studies of 18 women who ranged in age from 22 to 50 years and who were enrolled at one of two further education centres in 1999 set in two of the most economically depressed areas of Melbourne. One site was a Community Learning Centre, where two classes participated, and the other was women-only full-time Technical and Further Education (TAFE) science course where mathematics was a significant component. Of the 18 women interviewed thirteen were early school leavers and all but two participants had one to four children at home who ranged in age from 1-17 years old.

In the year of the study (1999), two classes at the Learning Centre participated in the research. One class covered essential numeracy as a component of a full time Information Technology CGEA. Initially 11 women enrolled in this course, ten completed it, and five agreed to be interviewed. The other class began as a VCE general mathematics course that initially enrolled 12 women. Only six students were consistently present from very early in the year, and four continued at the VCE level. The two other students, who struggled with the mathematical content, were encouraged to stay by allowing them to convert to a Certificate in General Education for Adults. All six students agreed to participate in the project. In the year of the study only women were enrolled in these classes though men were not excluded.

The TAFE college course was developed for women who were early school leavers to provide them with the option of entering into areas of further study that are non-traditional for women. According to the teacher a women-only class was to encourage women to take more risks than they might normally have done if men were present. There was also a commitment to group work as it was believed there was immense value for learners to verbalise their own understanding and hear others clarify their reasoning. Fifteen women initially enrolled in the course, but at the start of the research project 12 were attending. Seven of the women agreed to be interviewed and six students completed the course.

Data collection

Following three weeks of class observations the students were first interviewed over two months. Regular observations of classes continued to the end of the course and interview 2 usually occurred by telephone. The interviews were semi-structured covering issues with respect to the five domains of learning of Baxter Magolda (1992) - their perception of mathematics, and the role of the learner, teacher, peers and assessment. In the first interview students were also asked about their reasons for

returning to study, their previous school experiences, particularly in mathematics, and the influence of their parents on their schooling. The follow-up interview explored similar issues with a focus on any apparent shifts in the students' perspectives on the role of the teacher and peers in the mathematics classroom.

Prior to the first interviews I had been informed by staff at the Community Centre that one of the reasons that some women gave for deciding to return to study was to be able to support their children more with their homework. At that time I did not envisage that this issue was related to the central aim of the study and so it was not a focus question in the first interviews. As the role of children emerged spontaneously as a strong theme in the first interview, the issue was followed up more systematically in the second.

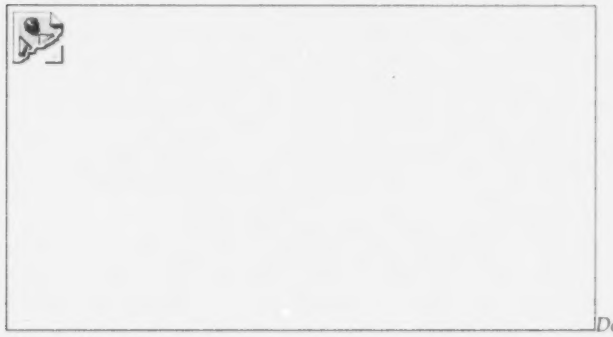
In the second interview I requested the opportunity to interview the women's children to seek out their experiences. Six women initially agreed, but one subsequently declined when her children conveyed they did not wish to participate and contact was lost with another woman. Ten children (four girls and six boys) whose school levels ranged from years 1 to 12 were interviewed at home (Figure 1). Although it was realised that children might respond more openly in the absence of their mother, for ethical reasons the child's mother was usually present during the interview. On reflection, I realised that having the mother present during the interviews was actually conducive to the purpose of the research, as the mothers were better able to draw out their children's ideas and opinions. If they had not been present, subtle details, I believe, would have been missed. In any case, most of the children found sensitive ways to convey to me some of their concerns. Sample questions included:

Thinking back to when your Mother first told you she was going back to study, can you remember what you first thought about that?

Has your Mother been able to help you more with your homework?

What has changed in your life since your mother returned to study?

Have you been able to help your Mother with her homework?



Do you think that conversations at home have changed since your Mother returned to study?

Figure 1: School year level of the children interviewed

As the mothers were mainly present during the interviews with their children, they also took this opportunity to discuss further reflections on the impact their return to study had on their family and on themselves.

Findings

In the first interview, half of the 18 women stated in one way or another, that one of their major reasons for returning to study was to be able to assist their children academically. Personal development, ambition and financial motivation were also key reasons mentioned for returning to study. The comments of these nine women resonated with the findings of Burns and Scott (1997) and Kelly (1987) as more global implications also emerged such as wanting to be a good role model and wanting to break the cycle of learning difficulties that they had suffered.

In terms of intended outcomes, all but one of these nine women reported (either in interview 1 or 2) that they had been able to support their children more with their school-work. What was also of interest was that five of these women also said they themselves had obtained assistance with their mathematical learning from their older children. The way these women discussed the interactions they were now experiencing with their children suggested that the quality of their conversations generally, but also about mathematics, were enhanced.

For five of the remaining nine women who did not convey in the first interview that assisting their children was a major motivating factor in their return to study, their children were of preschool age. For two women their children were no longer at school and this situation was now experienced as a chance to pursue delayed opportunities, "*there must be more to life than children*". One woman only spoke about the difficulties balancing the responsibilities of study and children, and one woman had no children.

From here I focus on the stories that emerged from interviewing the four families where the children agreed to be interviewed. Extracts from the initial interviews with the women with respect to their family of origin, their motivation to return to study,

and the changing role of peers in a collaborative mathematics classroom, set the context for the comments made in the subsequent interviews with the children. To ensure a high level of anonymity the courses the students' were enrolled in have been omitted and some minor family details have been altered.

Family 1

Clare, in her late thirties, left school at the end of year 10, due to the influence of her parents. Clare described her family of origin as "*typical* " - "*mum at home that sort of thing* ". Her reflections on her life pathway in interview 1 suggest an emergent sense of indignation of how she had been failed both by the school system and by the values of her own family of origin. Clare's description of herself doing mathematics at school resonates with Belenky et al.'s (1986) notion of the silent student - voiceless, unable to learn.

> *Maths and reading were always a chore for me. ... Maybe because I was so quiet and I never asked for help. ... I just seemed to have a mental block with maths. Maybe it was the way I was being taught. ... if there are instructions or if somebody shows me how to do something I find that much easier to pick up than reading instructions. So I am a hands on person. ... I think women are streamed one way and men are streamed another ... if their parents didn't think they could cope with university or go higher they would stream them one way. ... I have always wanted to go back and do something myself but whether I will get the chance or not (laugh).*

In this first interview Clare revealed that being able to assist her children was an important anchoring point in her efforts to remain focused on her studies.

> *I am plodding, I am not sinking yet (laugh). I am actually amazed at what I am doing. I suppose I look at it differently, and I am not going to let it beat me. Like even if I don't sit tests or anything like that, I feel that I can help my kids, and look at things differently too.*

Clare was extremely close to dropping out of the mathematics course mid way through the 1999 year partly because her anxiety with the subject nearly overwhelmed her. With peer and teacher support, she chose to continue and was subsequently offered a university place for 2000 through a mature-age entry program. In the second interview 12 months later, Clare revealed she had decided to decline this offer. Instead, she chose to enrol in a TAFE college diploma in welfare studies. Her reasons for this choice were based on both economic factors - fees for the TAFE College were significantly cheaper - and she believed a more supportive peer group environment was present at TAFE. This was not an uncommon choice of study pathway among the other women for similar reasons.

Clare's three children ranged in age from seven to 15. From the extracts below Clare describes a shift in attitude towards mathematics and how this has changed the way she is able to engage in conversations with her children about the subject.

> *I know what my kids are talking about when they are doing their maths. I have some idea (laugh). Whereas before I had NO idea. So in that respect it is GREAT! ... Even with the eldest, when he is talking about different aspects of maths, I know what he is talking about. Not necessarily maybe helping him but I know where he is coming from, what he is talking about.*

Having shifted from being a silent student, Clare is more attuned to how her children are at risk of repeating her experience.

> At school I wouldn't even ask questions, ask for help, whereas now I ask, I am there to learn. I don't have the same attitude as I did when I was younger. And I look at my kids and they are probably a bit that way too. They don't necessarily ask when they need help. Leon is a very sensitive kid, and I was too, I never wanted to look as though I was an idiot by asking a question.

The influence of a collaborative mathematics classroom over the study year seemed to be instrumental in the shift she described.

> *What I used to find frustrating was that you would get to a point and then I just couldn't go any further, especially with algebra. You would get to a certain point and you would think does this go down there, or what do I do with that? Sandra would say, "well do you remember when we did this?" You know. And I would say "oh yeah".*
>
> *I: She wouldn't necessarily tell you what to do?*
>
> *No. It was good. So I found that great. You couldn't do that in a classroom environment with the teacher up the front. Especially when classrooms are so big and they have 30 in a classroom.*

In the context of describing how his mother now helped him with his homework, Clare's 12 year old son Leon described a very similar style of interchange with his mother. His comments suggest that the type of peer interaction Clare was experiencing in the classroom was now being utilised in the home.

> *Leon: She didn't give us the answers for them, she just helped us.*
>
> *I: Ok. And how did she do that?*

Leon: What do you mean?

I: Well you made a distinction between not giving you the answers and something else.

Leon: She reminded us of things, and if I had forgotten something she might say um, like "do you remember when you did that?"

Along with the changing role of peers in the classroom was a change in how Clare viewed some aspects of mathematical knowledge that is consistent with Baxter Magolda's model.

I: In the first interview you said you viewed maths as a set of rules, that there is a right or wrong answer, you can't sort of manipulate it to suit yourself.

Well I suppose that is the classical, what I enjoy and what I don't. Because with statistics you can, there is no right or wrong answer. It is what you find it out to be. Are you with me?

I: Yes. Please keep going, it is interesting.

Yeah I suppose financial, you are working it out to be, what would some statistics be, you are finding what your median and mean to be. Whereas it is not BLACK and WHITE.

I: Why is it not black and white?

(Pause) Well it depends on the information you are actually using. That's a hard question.

I: It is interesting that you say that. Because it obviously shifted when you did the stats, you realised that maths didn't have to be right to wrong.

Yeah. Maybe that's because I found it easier, so, I perceive it as being different (smile in voice). I don't know (laugh).

Statistics is of course commonly not viewed as "true" mathematics, and yet I think the comments are important in the sense that Clare enjoyed the fact that for some mathematics, at least, it no longer had to be viewed as an absolute body of knowledge.

During the interview with her children Clare went on to convey that not only do her children provide her with a way to put into practice her enhanced intellectual and personal skills, but they also provide her with a measure of how much her confidence has increased.

They are probably changing just as much as I am. But I think that my listening skills are better, I am definitely more articulate, and I can express how I feel, and I am more observant of how they feel too. Makes a difference. *(Comment during the interview with her children).*

Leon's reflections on how conversations are different in the home are consistent with his mother's comment, though they clearly provide a different quality of perspective. In the extract below he would appear to be conveying that he feels listened to more by his mother perhaps in a less judgemental way.

Leon: I don't know if this is with us getting older or something but we have been able to talk with Mum a bit more as in Mum's not really strict, she is still strict, as in we have laughs with her, it has just changed in that way.

Clare's older son's initial thoughts about his mother returning to study were of a different quality. Being the oldest child (15) he conveyed two perceived unwanted pressures on him, one was a belief he would have to take greater responsibility for the two younger children.

I: What did you first think when your mother returned to study Daryl?

Daryl: That I would have to look after the kids more. I thought "that is going to be great!"

Clare: But you didn't have to! (Mother challenges)

Daryl: I did! ... wasn't that bad. Didn't really worry me that much.

The other perceived unwanted pressure Daryl spoke about was to do as well academically at school as his mother. While often the basis of many family conflicts in general, having mother studying as well can apparently introduce a level of competition into the equation.

Clare: Leon has always been conscientious with his homework, whereas! *(turning to Daryl)*

Daryl: (laugh)

Clare:(as if to quote a typical comment from Daryl) "just because I get A's, doesn't mean I am going to get A's."

I: What does that mean Daryl?

Daryl: Just to rack her up. "Oh, you get high distinctions, you're square", stuff like that.

Despite this apparent friction between himself and his mother over his academic attitude, Daryl volunteered towards the end of the interview that he was aware that his mother was "*probably happier* " having been able "*to get her own time away, (pause) from Ian(laugh).* " (Ian was the youngest child). Hence the issue of unwanted greater family responsibility falling to him was reinforced.

In terms of being able to assist her children more with their homework, this was more evident for English as both boys were reasonably competent with their mathematics.

Leon: Mum read our books so she could help us in English.

Daryl: Mainly with English.

Clare: I think he showed me a thing or two with the maths! (laugh)

Daryl immediately confirmed that assistance with homework had been reciprocated.

Daryl: I did a little bit. Not much. She was doing year 11 and I was only doing year 9, so (laugh), it was a bit hard, but, I helped her with a few things.

Clare's youngest child Ian, year 2 level, said he had forgotten his mother was studying until the interview and had little to communicate. As this was the first set of interviews with any of the children I wondered whether this was an age factor. It seemed consistent with the assertion by Burns and Scott (1997) that the benefits were more apparent for older children. This initial perspective was contradicted in interviews with girls of similar age to Ian.

Family 2

Linda was in her mid 30s and married with three children ranging in age from 6-15 years. Linda described a similar secondary school experience and comparable family of origin values. Like Clare, her parents seemed to have had both low educational aspirations for their daughter and lacked the knowledge and confidence to be involved in her education.

Linda: It was pretty tough (laughter)... it was a tough area growing up.

I: How did your parents influence you in your studies?

Linda: They didn't sort of worry, school was supposed to take care of that. It wasn't to be brought home. Occasionally my homework wasn't done on time and Dad would sit down and try and help. But Mum, well, wouldn't be able to. You were a girl and you were going to finish in fourth form anyway and go on and do office studies Dad would say, 'you are not doing any good so as soon as fourth form comes up you are out of there. Not to say sort of, 'why aren't you doing well in maths?

Linda gave many reasons for returning to study but being able to support her children with their education was a feature.

Linda: The business went broke so obviously I had to get out there and just move myself. A bit of reality sets in and the old pay packet gets a bit thinner (laugh). And that was really financially motivated, and I just needed my brains to get working. ... the kids were coming home and talking and some days I was just switched off. And I thought this is hopeless, ... I am just stagnating. ... With my son he is 14 now and I have noticed his work is becoming a bit daunting, and I felt the need to sort of help him, whereas, my parents didn't do that.

In interview 2 these comments were followed up to try and gauge the level of importance of her children in the decision to return to study. In her comments below there is even a kind of apology for conveying her children were a part of her motivation to return to study.

I: In the first interview you said that the kids were coming home some days and talking and you were just switched off and you thought, this is hopeless. It sounded like the kids kind of triggered you in some ways?

Yeah, you do things for your family. I mean, I really, possibly, oh well I did it for myself I suppose ideally, but in the back of your mind ... like I had this mundane job, ... but I had to get out there and do something and improve myself. FOR the kids.

In the follow-up interview Linda's comments resonated with the notion of her developing her own voice. There is a sense of her moving away from silence, as described by Belenky et al. (1986), epitomised by a sense of feeling dumb and stupid, and with this shift came greater honesty in her relationship with her son.

I do feel more self-assured. And I do speak out a bit more. Whereas I tended to hang back and think I better not say that because that might be stupid.

I: Does that also relate to the kids schooling?

Oh yeah. Speaking to my son I speak out more about schooling now than I did before I did the course. In the way that he should think about school.

I: In the first interview you said his work was becoming daunting. Are you able to help him now?

Yes. I am now because he is doing similar things to what we did last year (laugh). Working out the areas, perimeters. Actually we were only doing that yesterday, and I thought "Wow, I did this! I can do this with you. (laughing) ... he is actually asking ME questions" (laughing).

I: So that wouldn't have happened before?

I probably would have looked at it and gone "Ask your father". Whereas now, I haven't had to say "wait till your father comes home" or" don't show me that".

I: Did you say that, "don't show me that?"

Oh yeah! A couple of times I said "I haven't got time for that", only because (voice dropped), I didn't know what he was talking about. But now I can read it, say "all right, let's have a look".

In interview her son was asked whether his mother had been able to assist him more with his mathematics. His response did not confirm his mother's experience, rather, he revealed he relied on his father's support.

I: Did your mum help you with your maths?

Anton: No, (laugh) not really (laugh). Sort of had to do that by myself. Maybe small things, but, not that much really, not much I remember.

I: I know something about measuring areas and perimeters came up with your Mum, she thought she was able to help you with some of that. Can you remember that?

Anton: No, not really, no. ... Most questions, like harder questions, I used to ask Dad to help me with them rather than Mum because Dad knew more about the maths questions than Mum did.

As we are dealing with different perspectives here it is difficult to know the extent to which his mother assisted Anton with his mathematics. In discussing this case with colleagues it was suggested to me that the son may not be as willing to admit he has received assistance from his mother academically and there may be certain loyalties he maintains with his father. Yet Anton did go on to tell enthusiastically that his mother had been of major support with understanding new technologies.

Anton: When mum first went to school she didn't know much about computers, Then once mum started learning about computers she was really helpful with computers.

Another possible interpretation is that the way his father assists him with mathematics may be quite different from the way his mother works with him. There is also another possible interpretation that is not mutually exclusive. For Linda, being able to assist her son with his mathematics was of far greater significance to her than it was for him. This interpretation is consistent with her stated motivation to return to study, where she spoke about his work becoming "daunting". It would seem that the few occasions when she could assist him had come to reflect for her a measure of her new confidence, her ability to tackle what had once been daunting academic tasks.

Linda also had two younger daughters who she said were also influenced in a positive way by her return to study.

They like it because they can simulate me. Like I would have my homework out and like "Mum's doing her homework, we have to do ours".(laugh)

Linda's oldest daughter Janie confirmed this was her experience too. The vibrancy of the changing home environment was conveyed with a touch of humour.

I: When your mum told you that she was going back to study, what did you first think about that?

Janie: I thought it was good for Mum that she was going back to school. I didn't think of it at first but then when she started, I started to really get it, because Mum used to come out and do all her work and sometimes I used to get my homework and sit right next to her.

I: What was that like?

Janie: Quiet! (giggle).

I: Quiet was it? What used to happen before?

Janie: We were all loud! (laugh)

The youngest child, daughter aged six, had a somewhat sad story to tell about the impact on her when her mother returned to study.

I: What about you Vicki?

Vicki: I was embarrassed that I was happy that mum was going back to school.

I: You were embarrassed?

Vicki: yeah

At this point in the interview I quite in-sensitively moved on to another question, missing an important point being made here. The only explanation I can give for this oversight is that Vicki spoke very softly, and I did not grasp fully the nature of what was being said. At this time her mother was out of the room but fortunately when she returned she asked whether Vicki had spoken about her experience of feeling embarrassed. The tape was turned back on and Vicki then told her story.

Vicki: After Mummy started, I said it at Show and Tell and I had my questions and everyone started laughing and they were talking to each other. And I got upset.

I: When you said you had your questions ready, what were they?

Linda: The children ask questions at Show and Tell. They will tell and the teacher then asks the children have you got any questions about that, and I don't think they had questions.

Linda went on to explain that her returning to study had been discussed within her own family very positively in terms of it being an important opportunity for her to finish her schooling. The explanation given for the poor response by peers at school was explained in this way.

I can remember Vicki saying that she thought that the kids thought that mum wasn't very clever. Because you are an adult you don't need to go to school. So she was embarrassed because they thought ... (Janie interrupted)

Janie: Well Mum is smarter than any other Mum now. The smartest Mum in the world!

Linda: I don't think so. Maybe more confident now perhaps.

Following completing the course in 1999, Linda applied for a job working in a busy medical office and got the position much to the surprise of her children.

The family was saying oh they won't pick you, you are too old ... it will be, like not a miracle, but I'll be surprised if you get a job. And the first interview I came back and I said "I got that job!" (laugh). And they just looked at me. I mean my husband was very supportive, but the rest of my family they were just astounded. ... they said, "Mum, I am so surprised, I really didn't think you would get anything." They were quite open about it. And it is so good for the children to see. ... hey if you go back to school,... you put the time in, you do get something better.

Linda's comments on the peer support that she experienced in the collaborative classroom reveal how crucial the environment was for her renewed confidence.

I: So how important was peer interaction in your own learning?

I think it was very important, I really do, so much so that it gave you a bit of confidence because you felt you are not the only one not understanding, but you are all in the same boat. Whereas before you are in a classroom, you weren't allowed to talk, you were not allowed to interact with anybody, so you thought you're problem was the only problem or you were the only one with that problem in the classroom, you didn't know how everyone else was feeling.

Family 3

Lynette, in her late thirties, was married with four children aged 10 to 18 years at the time of the interview with them. She also left school early in year 10 to care for her younger siblings. Like Clare and Linda, for Lynette there was little support to continue her academic studies from her parents despite doing well in her studies, particularly in mathematics.

Lynette: I dropped out at the end of year 10. I was always very good at maths, but in year 10 I had this teacher who you could say was pretty bloody hopeless (laugh) and I found that really frustrating. A lot of the time I was actually showing her how to do some of the work. ... I just went down hill and lost interest then, and I thought to hell with it all. ... My parents didn't encourage me to stay at school I just said I am not going back next year and it was all hunky dory, "fine, go and get a job." They were quite happy for me to go out and bring some money into the house.

Compared to Clare and Linda, Lynette did not convey as strongly in interview 1 that her reason to return to study was motivated by wanting to assist her children. Rather, this was a time to now focus on her own life. Yet when we discussed the impact of returning to study mathematics on her everyday life her children came immediately into focus.

> *Lynette: I have been able to use it a bit with my kids because they are in high school. Yeah. measuring triangles and all that sort of stuff came in handy. I finally know how to do it now (laugh). Because I had forgotten it from school. So yeah I have been able to help them out so it has been good.*
>
> *I: That is one thing that has come up in other interviews is the extent to which people come back also for their children.*
>
> *Lynette: That was part of it. Yeah. But basically I needed something to do with myself. I was, I suppose in a mid life crisis (laugh). I sort of needed to do something, I was getting frustrated with myself and I didn't have enough to keep me going, like my kids are getting older, so I thought well I've just got to do it. I've got to go back to school and learn something,*

Lynette said the response of her children to return to study had been very positive and this was with respect to an enhanced attitude towards their own studies.

> *Lynette: They think it is terrific. It has given them actually a bit of a buzz, because they are more keen now to actually get down and study themselves. I say, "look I dropped out at 16, and here I am I have gone back now. Because you know I have missed out on a lot." That has given them a boost. They are really getting stuck into it, it has been great. And Susie thought it was fantastic because she has been doing decimal work and I would come home with a decimal sheet and we would sit there and do it (laugh) together. And she is only in grade 5. She thought it was so funny, she says, "I can't believe I am doing the same work as you Mum (laugh)". It was good though. We work on her sheet and then we work on mine (laugh). I even bought the MBA blocks (laughter).*

Both Lynette's daughter and older son (16) confirmed their mother's experiences.

> *Susie: She helped me with my maths. Because my teacher last year didn't exactly explain everything to me. And that made it a bit harder. So everyday I went back home and asked her to explain it properly to me.*
>
> *I: And did your Mum explain it better than the teacher?*
>
> *Susie: Yep.*
>
> *I: Any examples, like one day I had this problem and ...*
>
> *Susie: (laugh) Well, one day when we were at school and doing decimal numbers the teacher just, like she likes to talk a lot. And she was just talking about stuff that we don't need to talk about. So, I went back home and my Mum explained everything to me, not like the teacher.*
>
> *Rob: She would help us with our homework a bit better.*
>
> *I: Can you give me some examples of that?*
>
> *Rob: Just practically my maths. ... when I couldn't do stuff she just explained it to me.*
>
> *I: Did she used to help you before?*
>
> *Rob: Oh, a little bit.*
>
> *I: But more when she went back?*
>
> *Rob: Yeah. She knew more about the maths.*

In interview 1 Lynette spoke about a growing appreciation of the approach to mathematical learning she experienced in her adult classroom.

> *Probably better off in a logical sense than learning all the old rules and stuff, because that is not study really. ... if you don't know the reasoning behind why you have got this rule you are buggered, you are not going to remember it.*

With respect to peers, at this time there was a sense their role was essentially to be supportive in a social kind of way.

> *Everyone is there to encourage each other, if you have got that back up it makes it so much easier.*

In interview 2 the role of peers seemed to have broadened and to be associated with an epistemological shift towards the nature of mathematics.

> *It just broadens your mind, because you do learn from other people, ideas of how they look at things. ... You can look at*

things from different angles, rather than just the normal way you would look at them, and think, like that's it, that's the way it is, when it doesn't have to be, like tha... the way it is, there are different avenues into a problem.

I: Some people would think maths is not like that to start with. Like maths is something that you do on your own and that there isn't different perspectives on things, just one way to do something, and one right answer.

But it depends on what you are doing though. if you are doing basic counting. Yeah. I mean that sort of thing is different, but with problem solving, there are different ways to get into a problem.

The new sharing of mathematical knowledge and skills by their mother was a point raised by Susie who clearly enjoyed these interactions with her mother. While Rob was more circumspect he also volunteered that his mathematical skills had also improved.

Susie: She would come home when she had learned her maths experiment or something at school and show me it.

I: So she would share what she had done at school?

Susie: Yeah.

I: Can you give me an example?

Susie: Well, (pause) she was doing this thing out of a piece of paper and had to get it like that without cutting it. And so she taught, I tried to do it, and then I finally got it (laugh).

I: So she didn't actually show you how to do it, she gave you the problem to do and you had a go with it yourself?

Susie: Yeah. And then once I got it, we got everyone else to do it.

I: So do you think your attitude towards maths changes at all because your Mum was doing it at school?

Susie: Yeah. Mine did.

I: Can you tell me a bit more about that?

Susie: Well how my teacher never explained anything, I was able to do more of the work than I used to, and it was easier for me.

I: What about you Rob?

Rob: I felt more confident and I could get the work in on time.

Family 4

Paula was in her late thirties and had four children aged two to ten years. Paula described a comparable background to the other three women.

My father had died and Mum never pushed education really, she was of the old generation when women were going to get married anyway. So you really didn't need an education. You just needed to work until you got married. So no, she never suggested I stay at school. The teachers wrote on my report that it seems a shame that I was leaving, that I could cope with the work. But that was all, there was no extra influence or great incentive to stay on.

Paula's reason for returning to study was to complete her secondary school education, as dropping out had been something she had always regretted. She also had a dream to go to university. With respect to the role of children in her studies, Paula only spoke about the difficulties she was having balancing study with her family commitments and this was spoken about again in interview 2 where it had nearly led her to drop out of the course.

I: Were there times last year when you thought you might drop out?

Oh several. After half time really, it seemed just a long year. I was simply too busy. The kids weren't sick or anything, I just couldn't find any time away from the kids.

Wanting to follow up the role of children in a different way, we also talked about whether she had found she had been able to help her school age children more with their mathematics.

Sally struggles with maths concepts.

I: Can you help her with that?

I try to, but I can't see why she doesn't grasp it. I do try to help her with it, and we don't fight fortunately. She will listen. But I have trouble getting back down to that level. Things seem so obvious to me and she can't grasp it. I guess that's why you need a primary school teacher.

I: I think part of it is to get them to talk about it, to see how they see it.

Yeah that's right. I have realised that because I have said the same thing three times and then I think "what am I doing, there is no point saying this thing three times is there?" If they can't grasp it the first time then you've got to find a different way of saying it, that is not how they are learning it.

These reflections suggest Paula was shifting in how she viewed the process of learning, in this case, with respect to their mathematical learning. These comments resonated with how Paula's interactions with her peer's in the mathematics classroom had shifted over the year. Paula had conveyed in interview one that she liked mathematics because there was one right answer, "*you're either right or wrong in mathematics and that's what I like* ." In Baxter Magolda's model an absolute orientation towards knowledge is associated with the role of peers being mainly social. Paula's early comments on the role of class peers resonate with this model. In a questionnaire response on the role of peers in her mathematical learning she had written that she would prefer minimal interaction and in interview one she conveyed the belief that mathematics was a subject one did alone.

I am not really looking for the social side of it, that is not really why I am here. I am really here to do the maths.

In interview 2 I engaged Paula about a shift that I had observed in the class towards a greater role of peers in her learning and here too there appears to be an associated shift of perspective towards mathematical knowledge. Towards the end of the comments it is important to note how the adult classroom experience is then translated into thoughts of how the school classroom might be different.

I: In the questionnaire you said you liked minimal interaction in the classroom.

Yeah.

I: And yet I thought there was more interaction in the classroom later on?

Yes there was and I initiated a lot of it too (laugh). ... Although Clare helped me too I felt it was more me supporting her. With Sandra, she had a different perspective on it I think. She saw things very differently to me, and when I got stuck, I could rely on her to, what do you say, look outside the square you live in .

I: Often people see maths as something that can be only learnt from the teacher or the text book, and often don't see peers as having valid maths knowledge. I am wondering whether that comes about in a class where people start to value their peers?

Yeah I do think so sure, for sure. And I think it would help 100% if the teenagers could do that with each other. I know that would be really hard, because a lot of the kids would carry on and muck around or whatever. But if they were able to feel more comfortable in speaking up then the other kids might be able to think, "oh, is that what it means? Because you tend to think in your own language don't you?

Turning back now to the home environment, Paula went on to explain that she could see the benefits for her children's development since returning to study.

Paula: It has forced them to be more independent. It has forced me to be, I don't know if you call it selfish, I think more about myself. When I went back to school I couldn't do some things for the kids, I didn't have the time. ... So when I went back to school it was actually "I have to do this homework right now. I will have to do that when that fits in." And I think that is good, I don't think that is a bad thing. They realise that you are a person outside of just being Mum, so I think it was good that they saw me go back to school. They couldn't believe it. Why would you go back to school when you don't have to! And do maths! (laugh).

Sally, Paula's oldest child confirmed her mother's reflections.

I: Do you remember the time when your Mum first told you she was going back to study?

Sally: I think I was 8 or something, but I think I said why are you going back to school?

I: What do you remember thinking about that?

Sally: Um, that she is too old to go to school.

I: In terms of doing homework, did you sit up and do your homework together?

Sally: Sometimes. Sometimes mum would be doing her work and "Mum I need your help" and she goes "hang on, I gotta do this first, this page."

I: So can you think of any way that your life changed because mum went back to study?

Sally: I think I had to do a little bit more work, but I was always a helpful person, I always used to get up on the chair and wash the dishes, mum had to do them again though.

Right through the research period Paula was clear that her reason for returning to study was not motivated by wanting to assist her children more. Rather, it was about her making up for her own lost academic opportunities. Despite this, throughout Paula's comment resonates a strong theme evident in the other women's experiences, that her intellectual growth is enhanced and even "measured" through the process of reflecting about her own learning with respect to her children's. Associated with an apparent increase in the role of her classroom peers in her learning is a parallel increasing role for her children.

Conclusions

For women returning to study mathematics, having children at home can provide a fertile environment to encourage them to verbalise their mathematical knowledge and understanding. In the classroom, encouraging women to verbalise their mathematical thinking can be quite challenging for adult practitioners and this may provide a fruitful avenue to explore. For example, legitimising and validating the changing conversations that occur at home about mathematics with children may support more engagement with peers in the classroom.

Some evidence has been presented that suggests that over the study period the role of classroom peers did shift for the women in accordance with Baxter Magolda's model (though also see Brew (2000)). This was associated with a parallel shift in their epistemological perspective on the learning of mathematics, and even for some, their perspective on mathematical knowledge. The focus in this paper was to illustrate how in turn, these qualitative shifts in peer interactions come to influence the quality of the conversations in the home when the women engaged with their children's academic learning. It is proposed that for women with children who have left school early and return to study, their children provide them with the opportunity to put into practice in a very concrete and useful way their new mathematical skills. In turn this seems to leads to their children assisting them in becoming more Independent learners through a process of connecting.

Also evident from the extracts provided is that the women's perspectives on the benefits for their children when they returned to study was generally confirmed by their children. From a review of the literature this would appear to not have been confirmed before, and was evident across the broad age spectrum despite the small-truncated sample. Apart from being a small sample, a further limitation of the study is that the views of children of women who dropped out of study, or those children who did not agree to be interviewed have not been accessed. Future studies would be enhanced by also interviewing the children prior to their mothers actually returning to study. Obtaining approval from women whose confidence levels are yet to be enhanced presents both an ethical and technical difficulty.

Central to the argument in this paper is that both the women and their children's intellectual growth are intimately connected. Adult practitioners who may be focused on wanting their adult students to come to focus on their own learning, to make a shift to seeing their own development as distinct from their children's, might be better off exploiting the connectedness, rather than the separateness. For three of the four women, their children were an integral part of their initial motivation to return to study, and they provided a gauge to how far they had come in terms of being able to assist them in their studies. The children also provided them with a means to demonstrate their renewed energy and confidence in life. For the four families discussed, their stories are one of transformation, of growing confidence, and a sense of having developed their own direction within the family. What is significant is the extent to which their children played a central role in getting there.

Acknowledgments

I would like to thank all the participants in my study who provided their time so generously, and Mary Barnes who provided helpful feedback on an early draft of the paper.

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